

REMARKS

Upon entry of the present Amendment-D the claims in the application are claims 16-36, of which claims 16, 22 and 28 are independent. New claims 34-46 are added herein.

Applicant respectfully submits that the above amendments are fully supported throughout the original disclosure. Applicant also respectfully submits that no new matter is introduced into the application by the above amendments.

After careful consideration of the objections and rejections set forth in the Office Action, applicant respectfully submits that as listed herein, all pending claims patentably distinguish over the art of record, and requests allowance of all pending claims, as discussed further below.

Claim rejections 35 USC 102

The Examiner rejected claims 16, 22, and 28 under 35 USC 102(b) as anticipated by Asaka et al (US 5,525,882). In the rejection, the Examiner states that Asaka teaches a position detection apparatus for detecting a position of a moving robot, the apparatus comprising a local image acquisition device 12R for acquiring an image of a forward view of the robot, a distance image acquisition device 12L having the same view as the local image acquisition device, the devices 12R, 12L acquiring images simultaneously. The Examiner states that the apparatus further comprises a characteristic point extraction device that extracts characteristic points from the images by a specific method (col. 6, line 55 – col. 7, line 12, Fig. 4A-C), and a reference characteristic point selection device that selects reference characteristic point for calculating the position of the robot based on the characteristic points and the distance image (col. 4, line 53-col. 5, line 7).

Applicant's Response

With respect to claim 16, the applicant respectfully disagrees with the rejection put forth by the Examiner. Upon review of Asaka, the applicant finds that Asaka discloses a method and system for maneuvering a mobile robot about an object. Visual sensors (cameras 12L and 12R) and sonar sensors 14 are used to determine elements of an object in the vicinity of the robot, a hypothesis of the object's configuration is formed based on the environmental data obtained from the sensors, and the robot is operated to avoid the object. Asaka discloses an image processor 26 connected to the cameras 12L, 12R which processes an obtained image to provide three dimensional information from the image using sharp brightness changes in the image to determine object edges. The image processor 26 is in turn connected to a stereo interpretation section 30. Asaka does not teach use of the stereo cameras 12L, 12R to determine robot position. Rather, Asaka uses a distance meter 20 and direction meter 22 (col. 5, lines 16-19) to determine robot position, and Asaka uses the cameras 12L, 12R along with the sonar sensor 14 to identify object surfaces, and avoid the corresponding object in its path.

Although the cameras 12L and 12R can reasonably be interpreted to correspond to the respective claimed image acquisition devices, the applicant does not agree that Asaka discloses evaluating the images for characteristic points, as claimed. Rather, at col. 4, line 53-col. 5, line 7, Asaka discloses that the camera image information is processed to select an edge where brightness abruptly changes, and the corresponding line segment is used to generate a hypothesis about the environment. In addition, at col. 6, line 55 – col. 7, line 12, and in Fig. 4A-C, Asaka discloses use of line segments to represent surfaces in the vicinity of the robot. Thus, Asaka does not disclose extraction of characteristic points, or a device to perform such an extraction since no characteristic points are extracted from images in the invention disclosed by Asaka.

Moreover, the applicant does not agree that Asaka discloses a reference characteristic

point selection device that selects a reference characteristic point for calculating the position of the moving robot, based on the characteristic points and the distance image, as claimed in claim 16. As discussed above, Asaka does not disclose use of characteristic points to calculate the position of the moving robot, since Asaka does not disclose extracting points from images but instead extracts line segments.

In addition, Asaka does not disclose use of characteristic points to calculate the position of the moving robot, as claimed, since Asaka does not calculate the position of the robot from this extracted information, but instead uses the sensor information to determine the presence of an object near the robot. In particular, Asaka discloses determination of robot position using a distance meter 20 and direction meter 22 (col. 3, lines 52-54 and col. 5, lines 16-18). Asaka also discloses (col. 13, lines 5-7) that the sonar ring device 14 and stereo cameras 12 can be used to determine distance and direction. Although it is not explicitly stated, it can be assumed that this data is used to determine distance and direction of the object relative to the robot since the application is directed to locating the object and avoiding it. Thus, Asaka does not disclose calculation of the position of the robot based on characteristic points and the distance image, as claimed.

With respect to claims 22 (method) and 28 (program), the applicant disagrees with the rejections of these claims for the reasons discussed above with respect to claim 16.

Because Asaka does not disclose or suggest the claimed invention, reconsideration and withdrawal of the rejection is respectfully requested.

Other Matters

New claim 34, which is an apparatus claim dependent on claim 16, new claim 35, which is a method claim dependent on claim 22, and new claim 36, which is a program claim dependent on claim 28, are added to the application which more clearly define the difference between the image acquired by the image acquisition device (in particular, brightness images) and the distance image acquired by the distance image acquisition device (in particular, distance image formed by determining the corresponding points of the pixels of each image from the two brightness images obtained with two cameras). These limitations recited in these claims are fully supported in the specification at paragraphs 51-53, and no new matter is added. These features are not suggested or disclosed by Asaka or other prior art references, and thus these claims are in condition for allowance.

Conclusion

In conclusion, the applicant has overcome the Examiner's rejection of claims 16-33 as presented in the Office Action; and moreover, the applicant has considered all of the references of record, and it is respectfully submitted that the invention as defined by each of the present claims is clearly patentably distinct thereover.

The application is now believed to be in condition for allowance, and a notice to this effect is earnestly solicited.

If the Examiner is not fully convinced of the patentability of all of the claims now in the application, applicant respectfully requests that the Examiner telephonically contact applicant's undersigned representative to expeditiously resolve prosecution of the application.

The Commissioner is hereby authorized to charge \$50.00 for one independent claim in excess of three, as well as to charge any deficiency which may be required during the entire pendency of the application, and to credit any excess paid during the entire pendency of the application, to Deposit Account 50-0744 in the name of Carrier, Blackman & Associates, P.C. A duplicate copy of this sheet is enclosed.

Favorable reconsideration is respectfully requested.

Respectfully submitted,



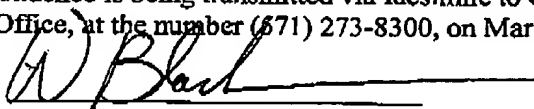
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